

U.S. Pat. Appln. S.N. 10/511,252
Date: February 13, 2007
Response to Office Action dated November 13, 2006

Page 9 of 14

REMARKS

In the Office Action dated November 13, 2006, the Examiner rejects claims 1-5, 7-11 and 13-16 under 35 U.S.C. § 102(b) and rejects claims 6, 12, 17 and 18 under 35 U.S.C. § 103(a). With this Amendment, claims 1 and 3 - 18 are amended. Claim 2 has been canceled, and no claims have been amended. After entry of this Amendment, claims 1 and 3-18 are pending in the application. Reconsideration of the application as amended is respectfully requested.

Applicants herewith have submitted a number of amendments to the Substitute Specification. Most of these changes correct typographical or grammatical errors throughout. In certain paragraphs, spelling now conforms to U.S. grammar. In paragraph [0023], Applicants add a U.S. publication number corresponding to the German publication number for easier reference by the reader. In paragraph [0036], Applicants replace the word "earthing" with "grounding" as "grounding" is the more commonly used technical term. Applicants have amended paragraph [0042] to remove reference number 8, which number is not included in Figures 2a and 2b. Finally, Applicants have replaced the reference to claim 1 in paragraph [0009] with the text of claim 1 as amended.

The Examiner rejects claims 1-5, 7-11 and 13-16 under 35 U.S.C. § 102(b) as being anticipated by Wallace et al. (US 5,769,581). The Examiner states that Wallace et al. teaches each of the features of these claims, including the feature of claim 1 of the force sensory effect of the force sensory layer and the feature of claim 2 wherein the force sensory effect consists in a change of electrical resistance of the layer on changing an applied force. Applicants have amended claim 1 to include the features of claim 2 and have further made minor grammatical changes to recite "a control device" in the preamble and to change the spelling of "characterized" to U.S. grammar. The feature of claim 2 in claim 1 clarifies that the force sensory layer changes its electrical resistance due to changes of an applied force as described in, for example, paragraph [0011] of the Substitute Specification. Conforming changes have been made to claims 2-17. In addition, in claim 3, the force-sensitive layer has been corrected to the

U.S. Pat. Appln. S.N. 10/511,252
Date: February 13, 2007
Response to Office Action dated November 13, 2006

Page 10 of 14

force sensor layer to clarify antecedent basis. Also in claim 3, "consist" has been changed to "comprising," and "having" has been changed to "including." In claim 4, it is clarified that the force-application comprises the head of a set screw and the nut complementary thereto on the set screw. In claim 5, clarification has been made that at least one of the upper and lower side are each provided at least in part with a respective force sensory layer. The antecedent basis for the force sensory layer has been clarified in claims 6 and 14. Finally, the spelling of glass-fibre has been changed to glass-fiber in claim 15.

Applicants respectfully submit that claim 1 and its dependent claims are not anticipated by Wallace et al. Wallace et al. discloses a washer 60 used to indicate and maintain the tension between a bolt 50 and a complementary bolt nut 42. Therein, the washer 60 is considered to be the measuring element, and it is provided at least in some areas with an indicating material 64. (Col. 4, ll. 57-67). The surface of the indicating material 64 has indentations 16 constructed for recording a force applied by the bolt head 50 and nut 52. Accordingly, Wallace et al. describes a purely mechanical sensor. It does not make use of any electrical phenomenon.

More specifically, the exertion of force between the force bolt head 50 and nut 52 causes the bottom of the bolt head 50 to contact protuberances 12 and begin to compress the protuberances towards the first surface 14 as shown in Figure 17. (Col. 5, ll. 19-22). Upon this action, the chamber consisting of the channel 62 and the indentation 16 shrinks in volume and the indicating material 64 eventually appears at the outer diameter of the direct tension indicating washer 60. (Col. 5, ll. 29-35). While this phenomenon is considered a change of resiliency, there is no teaching or suggestion of the force sensory effect as defined by Applicants, that is, a change of electrical resistance of the force indicating material. Again, Wallace et al. is a purely mechanical sensor. Accordingly, Applicants respectfully submit that claim 1 and its dependent claims are allowable over Wallace et al.

In addition to the foregoing, Applicants respectfully submit that Wallace et al. fails to teach or suggest the features of dependent claim 3. The Examiner states that the layer 64

U.S. Pat. Appn. S.N. 10/511,252
Date: February 13, 2007
Response to Office Action dated November 13, 2006

Page 11 of 14

is of silicone and the indicator 30 is made of carbon steel. Applicants submit that this is not the element of claim 3. Instead, claim 3 includes a force sensory layer comprising diamond-like carbon-based layers including at least one of an amorphous and nanocrystalline structure. Neither silicone nor carbon steel is a force sensory layer comprising diamond-like carbon-based layers including at least one of an amorphous and nanocrystalline structure. In the invention according to claim 1, the force sensory layer changes its electrical resistance in response to an applied force. In claim 3, a specific material is disclosed and claimed for this layer. Neither silicone nor carbon steel performs the function or includes the claimed material. Neither is such a material suggested by Wallace et al. because Wallace et al. does not teach or suggest any piezoresistive materials. In addition to the reasons stated with respect to claim 1, from which claim 3 depends, claim 3 is allowable based on the features recited therein.

With respect to each of claims 8-12, the Examiner states that the protruberances 12 are separately located on a surface of the indicator 30 and have a rounded shape. However, it is respectfully submitted that these features fail to teach or suggest the feature of claim 9 wherein a plurality of annular prominences is provided and are arranged concentrically relative to one another. In addition, these features also fail to teach or suggest the features of claim 11 wherein a plurality of prominence areas is provided, wherein each of these have a different type and/or number of prominences. Applicants further submit that, upon a careful review of Wallace et al., Applicants have failed to find any teaching or suggestion of these features in Wallace et al. Applicants respectfully submit that claims 9 and 11 are allowable over the prior art of record based on the unique features recited therein in addition to the features of claim 1, from which each depends.

The Examiner also states that, with respect to claims 14-16, that the indicator 30 of Wallace et al. has an opening that includes a coating. However, it is respectfully submitted that the layer according to claim 16 is composed of amorphous carbon. There is no teaching or suggestion in Wallace et al. of making a force sensory layer of amorphous carbon. This is desirable due to its electrical properties. As the Examiner earlier acknowledged, the indicating

U.S. Pat. Appln. S.N. 10/511,252
Date: February 13, 2007
Response to Office Action dated November 13, 2006

Page 12 of 14

material 64 is made of silicone. Applicants respectfully request examination and allowance of claim 16.

The Examiner rejects claims 6, 12, 17 and 18 under 35 U.S.C. § 103(a) as being unpatentable over Wallace et al. in view of Walton (US 5,291,789). Claims 6 and 17 depend directly from claim 1, while claim 12 depends from claim 11, and claim 18 depends from claim 17. The Examiner states that Wallace et al. teaches all the features of claims 1 and 11 but correctly notes that Wallace et al. fails to teach or suggest the features added in these claims. The Examiner further states that it would have been obvious to modify Wallace et al. with the teachings of Walton for the purpose of advantageously providing a method to indicate the load to which a member is subjected that includes an indicating means that gives an electrical signal when the stress to the main body of the fastener exceeds a predetermined value.

First, however, as explained above, Wallace et al. does not disclose the utilization of the phenomenon of electrical resistance in claim 1 and its dependent claims. Walton discloses a hollow member such as a bolt 114 having first and second electrically conductive elements 124, 131. During the tightening of the bolt the first electrical member 124 is moved closer towards the second electrical member 131 and at a certain tension, the two elements connect and form a closed electrical circuit that ignites a bulb or a similar element. Wallace does not utilize the phenomenon of changes of electrical resistance within a layer, as is disclosed in Applicants' invention. Applicants' invention teaches that the electrical resistance of an electrical circuit changes from an infinitely high to a very low resistance, hence allowing a flow of currents. Further, Wallace et al. fails to teach how the phenomenon of electrical resistance could be utilized in a force sensory layer. Since neither Wallace et al. nor Walton teaches or suggests the feature of claim 1 wherein a force sensory layer changes its electrical resistance due to changes of an applied force, the combination does not teach or suggest such a layer.

Applicants further submit that the Examiner's motivation is based on hindsight. In assessing the obviousness of a claimed invention under 35 U.S.C. § 103(a), the Examiner is not allowed to pick and choose among references to find the missing features of the claimed

U.S. Pat. Appln. S.N. 10/511,252
Date: February 13, 2007
Response to Office Action dated November 13, 2006

Page 13 of 14

invention to deprecate the invention. The motivation to combine the references must instead come from the art. In this case, even if Wallace et al. were combined with Walton, the combination would make the protruberances and indicating material features of the inventive direct tension indicating washers unnecessary in Wallace et al. One could merely try to use the construction consisting of the electrically conducting elements 124, 131 within the indentation 16 of Wallace et al. Such a device would not allow a continued measurement of the applied force and would not include the claimed feature of the force sensory layer. Similar to Wallace et al., such a combined disclosure could light a bulb when a certain force is reached.

For the foregoing reasons, the recited combination fails to teach or suggest all the features of claim 1, from which claims 6, 12, 17 and 18 depend, either directly or indirectly. In addition, Applicants submit that the purported combination fails to teach the features of claim 11, from which claim 12 depends. As mentioned above, Wallace et al. fails to teach or suggest the feature of claim 11 wherein a plurality of prominence areas is provided, wherein each of these have a different type and/or number of prominences. Since Walton also fails to teach or suggest the feature, the combination fails to teach or suggest the feature.

Finally, the claimed subject matter involves something unexpected or surprising in view of the cited references. The utilization of the suggested force sensory layer and the measurement of the change of the electrical resistance of this layer due to a change in the applied force offers advantages over the prior art. In combination with the attribute that the surface of the force sensory layer has support profiles that are flat but may have varying geometries within the flat profiles, sensitive measurements can be performed over a large interval of forces. This is due to the properties of the claimed force sensory layer. In none of the cited references or the prior art is suggested the utilization of a force sensitive layer with special geometries to achieve a continuous and sensitive measurement of forces.

Thus, any combination of disclosures in Wallace et al., Wallace et al. and Walton, or Wallace et al. and Walton and a further reference would have a common inability to satisfy the

U.S. Pat. Appln. S.N. 10/511,252
Date: February 13, 2007
Response to Office Action dated November 13, 2006

Page 14 of 14

terms of claim 1 of the present application and can not be said to make the invention claimed in claim 1 and its dependent claims obvious under the standards of 45 U.S.C. §103(a).

It is respectfully submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Consideration of the application as amended is requested. It is submitted that this Amendment places the application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that other and different claim terminology would better define the invention, she is respectfully requested to call Applicants' attorney at the number shown below in an attempt to agree upon an Examiner's Amendment to allow the application to pass to issue.

Respectfully submitted,

YOUNG BASILE HANLON
MACFARLANE & HELMHOLDT, P.C.

Darlene P. Condra
Darlene P. Condra
Attorney for Applicants
Registration No. 37113
(248) 649-3333

3001 West Big Beaver Rd., Suite 624
Troy, Michigan 48084-3107
Dated: February 13, 2007
ARB/MLK/DPC